REMARKS

The Examiner's comments in paragraph 5 have been noted and additional changes have been made in independent Claims 51, 59, and 61 in which it is stated that the replaceable cutting element is mounted "off center from the axis of rotation of said bit." This clearly limits the use of the element as a drag element rather than a conventional drill which rotates about it's own concentric axis.

The Examiner's objection regarding the introduction of new matter is now moot by reason of the changes made to claim 60, wherein the range of included angle is changed to "½° and 60°" which is supported in paragraph 55 of the specification.

The rejection of claims 51, 52, 54, and 55 under §102(b) as being anticipated by Mills, et al. is respectfully traversed. The Mills element 48 is not a drag-bit element. Element 48 is a "pilot bit" (see column 5, lines 1-8) used to hold the overall drill assembly on a constant drilling axis. Its function is to drill a hole like a conventional wood or steel bit. The structural loading on the Mills pilot bit is substantially different from that of a drag bit element. On Mills, the loading is strictly torsional as the hard metal flat blade 48 bores a hole in a stationary surface. The drag bit elements 64, 66, and 68 of Mills are referred to as "gage cutter elements" like the present invention, are dragged across a rock surface being cut at a particular angle of attack which are subject to loads in shear, bending, and compression from the surface being fractured. Figures 3 and 6, in Mills, do not show the full details of the pilot bit that is a hard metal flat blade 48 attached to a central steel support shaft 50. A quadrant of this shaft as seen in Figure 3 is absent at the end in front of the blade and another quadrant of metal is absent at the rear of the blade on the opposite

side of the bit. These absent areas allow the sharp edge of the blade 48 to engage the formation being cut. These absent areas are illustrated in Figure 3 of Mills, with shading at the surface. The present invention defines a contact structure in paragraph (003) as the end portion of the cutting element "which directly contacts the formation". The tapered structure of the Mills patent is not a part of the contact structure as defined in the claims of the present invention because the clearance angle prevents it from making direct contact with the formation being cut. The Mills "pilot cutter 46" is essentially a guide that prevents the overall rotary bit 10 from moving off its axis. Pilot bits similar to Mills are well known in the art as illustrated in the enclosed KENCLAW DRILLING SYSTEM BITS, as shown in Exhibit A.

Regarding claim 52, the Mills pilot cutter 46 does not have an "engagable" structure. We cannot consider the two opposite arcuate quadrants, as seen in Figure 8 of support shaft 50 to be an engagable structure.

Claim 54 calls for the tapered structure to be conical, and again looking at the Figure 8 of Mills, there are two quadrants that have no conical surface and, therefore, the structure does not read on claim 54.

Regarding claim 56, Mills definitely does not teach a non-cylindrical engagable structure and the edges of blade 48 cannot be considered an "engagable structure".

The rejection of claim 58 under §103(a) as obvious over Mills et al. is respectfully traversed. The loading of the Mills pilot bit 46 is totally different from that of drag-bit elements and, therefore, the design is substantially different. An illustration of this is shown in Mills itself, which discloses drag bit elements 64, 66 and 68 of a totally different configuration from pilot cutter 46. Drag bit elements are drug across a rock surface

whereby the cutter elements with a pointed end fracture the rock with the pointed free end 88. The cutters are set at approximately at a 45° angle to the surface being cut to minimize the bending load on the cutter. The obtuse angle of applicant's tapered structure permits the element to utilize more brittle hard materials at its points since the obtuse support structure gives the more brittle point material more support in shear. Claim 58 is novel for the reason stated above regarding claim 51, which is dependent thereon.

The rejection of claims 57, 59 and 60 under §103(a) as being unpatentable over Mills in view of Reusser is respectfully traversed.

Applicant hereby cites the new reference to Tibbitts et al, U.S. Patent 5,906,245, which was discovered after filing. In Figure 18 of Tibbitts, a partial tapered thread 334 and 336 is shown at the top of the mounting structure with a tapered plug 330 extending below the tapered thread. This reference is the only teaching applicant is aware of whereby a drag bit element is mounted with a tapered thread. The purpose of applicant's use of a tapered thread is to provide a threaded joint where there is no tolerance between the elements, so the element can be "self locking" as claimed in claim 59. Tibbitts requires a locking key 338 in Figure 18, which apparently means Tibbitts feels that the drag element 320 could work itself out even with a conical screw thread which is support for the argument that it is not obvious that if you use a tapered thread without some locking means that the tapered thread alone will render the element self-locking as claimed by applicant.

For Tibbitts's conical thread to have a no-tolerance fit, it would also be necessary at the same time for the plug portion 330 of the element to have a no-tolerance fit and to build such an element where both threaded surfaces and tapered plug surfaces have a no-tolerance fit would be a very impractical and difficult design to achieve for obvious reasons.

Other differences between applicant's conical thread element in Figure 11 are as follows:

The contact structure of Tibbitts' Figure 18 element has no tip structure, therefore, the off-center loading of the element is subject to greater torque for loosening the element. Applicant's design with its concentric tip structure 124 minimizes the torque loading. Secondly, it is pointed out that Tibbitts tapered thread is not self-locking since it requires a locking key 338.

Lastly, it is pointed out that when replacing the Tibbitts element 320, the wear in the mounting socket will cause the replacement element to no longer have a tight thread fit in the socket since the locking key groove was clocked to the original no-tolerance fit without wear on the element or the socket. Such a loose fit would be totally unacceptable for a drag bit element.

Applicant concedes that the usage of conical screw threads are well known in various applications for various uses, however, none have ever been used on a drag bit element with the exception of Tibbitts wherein the loading on the element is normal to the axis of the mounting threads and the element with the exception of the above mentioned Tibbitts reference. Removable elements that are held in place by standard straight helical threads do not stay tight without some separate locking means. A lateral loading on the element causes the element to tilt within the clearance between the threads and unscrew. In the case of conical helical threads drawn tight, there is no tolerance in the fit, as there must be with standard threads so that when a conical threaded element is tightened, there is no clearance between the threads of the body and the threads of the element. Conical threaded

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elements as shown in Figure 11 do not work loose in use as does a straight thread which has the necessary tolerances to permit the parts to be screwed together.

The tapered thread taught in Reusser is used in a well casing or tubing joint, which carries high tensile loads up to 150 tons as distinguished from lateral loading on the joint. The principal advantages of tapered threads mentioned in Reusser are joint strength, sealing capabilities and ease of assembly. Axial loading on a threaded joint compared with lateral loading of a drag bit is substantially different. The tapered thread is used in the present invention to keep the element from unscrewing during use caused by lateral intermittent loading which is different from the advantages mentioned in Reusser.

The combination of the Mills bit with the Reusser tapered thread is not taught by either of the references alone or in combination because of different intended uses of each and, therefore, it would not be obvious to someone having ordinary skill to make such a combination. It is readily conceded that there are advantages to conical screw threads as discussed in Reusser, however, the advantage for the use of the conical screw thread in the present invention is not taught or anticipated by Reusser or any of the other references of record including Tibbitts.

Applicant's conical thread used on a drag bit element will not work its way to unscrew during use because there is no clearance between the threads, while a straight threaded joint would. In a sense, applicant's conical thread mounting is self-locking. Applicant also has a second novel advantage of its conical thread in that it takes up less space on the bit body so that more elements can be placed closer together as shown in Figures 13-19.

Respectfully submitted,

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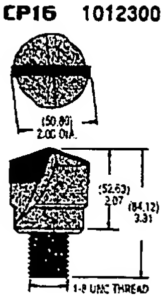
EXHIBIT "A"

pilot bits

CP16 1012300



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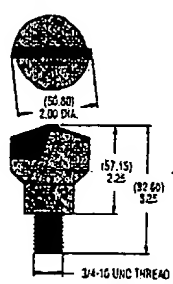

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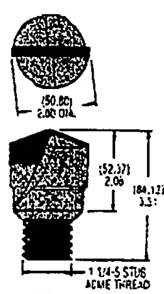

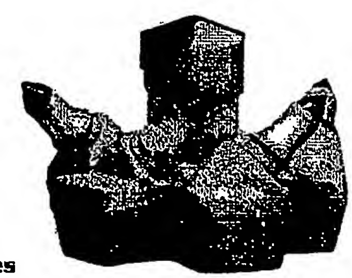

shown:
C6 1/2-10NS assembly

pilot assemblies
...for vertical and horizontal boring

- **C6 1/2 10NS** 1012251
  comes equipped with C3 conicals and a CP18 pilot bit.
- **C6 1/2 20NS** 1012334
  comes equipped with C23 conicals and a CP18 pilot bit.
- **C6 1/2 87NS** 1012254
  has C387LR conicals and a CP18 pilot bit.